From: PETERSON Jenn L
To: Eric Blischke/R10/USEPA/US@EPA
Subject: RE: Bioaccumulative sediment criteria for Copper
Date: 12/05/2006 12:37 PM
Attachments: Wildlife TRVsSampleetal1996.pdf

Eric,

Copper, along with zinc, cadmium and mercury have been shown to accumulate in the diet of prey items in other systems to unacceptable levels - I guess we will find out in PH soon. However, I think it will certainly be in localized areas.

As for the methodology used to derive the sediment numbers, see the following ORNL document, page 9, equation 28.

-Jennifer

-----Original Message-----
From: Blischke.Eric@epamail.epa.gov
[mailto:Blischke.Eric@epamail.epa.gov]
Sent: Tuesday, December 05, 2006 12:20 PM
To: PETERSON Jenn L
Subject: RE: Bioaccumulative sediment criteria for Copper

Thanks for the summary Jennifer. I knew I could count on you. So here are what I think the key pathways for copper are:

1) Water column effects on fish and other aquatic organisms
2) Direct effects on the benthic community as evidenced by bioassays or through comparison to SQGs (e.g., TECs, PECs)
3) Direct effects on the benthic community as evidenced by comparison of clam tissue to tissue residue critical tissue values.
4) Indirect effects on aquatic life through consumption of benthic organisms. This evaluation could be performed as part of a dietary pathway analysis that makes use of site collected clam data and perhaps laboratory bioaccumulation studies on clams and lumbriculous.

Regarding the last piece, it is unclear to me whether copper would be uptaken by clams and worms at concentrations that pose risk to consumers of clams and worms.

One other question - regarding the application of the Kow/Koc relationship - these seem most applicable to organic chemicals and not chemicals like copper which partition based on factors such as pH, redox potential, and the types of anions present with which copper can form complexes. How was the partitioning analysis performed? How applicable is it? Should I check with Bruce?

Thanks, Eric

PETERSON Jenn L <PETERSON.Jenn@deq.state.or.us>
12/05/2006 12:00 PM

To: Eric Blischke/R10/USEPA/US@EPA, POULSEN Mike <POULSEN.Mike@deq.state.or.us>
cc:
Subject: RE: Bioaccumulative sediment criteria for Copper

Eric,

Copper bioaccumulates but would not be expected to biomagnify up the food chain. This is because of the regulation that occurs in fish tissue would not allow it to accumulate to high enough levels that wildlife feeding on the fish would be at risk. That is why it was not include in our bioaccumulation guidance. As for DEQ's bioaccumulation number in the JSCS, it is based on the DEQ 2001 sediment numbers put together by Bruce H. This was based on an allowable water concentration for a representative piscivorous bird (GBH). It just takes the acceptable water conc. for water and food consumption (assuming some bioaccumulation using a food chain multiplier) and converts it to a sediment number using Koc / Kow relationships. Therefore, it is based on theoretical partitioning and does not consider metals regulation by fish.

This does not mean, however, that copper does not accumulate in invertebrate tissue resulting in effects either in the inverts themselves when a threshold level is reached, or on fish or wildlife feeding on invertebrates with accumulated residues. In Portland Harbor, we are getting at this pathway for inverts by looking at clam tissue

residues and comparing them to TRVs and for fish we are looking at the dietary line of evidence.

However, copper is well known for its ability to interfere with osmoregulatory function in salmonids, as well as act as a direct gill toxicant in water. Water concentrations compared to TRVs are very important for evaluating these effects. Cooper toxicity of the gill has been well studied on fathead minnow and rainbow trout, and has been used as the poster child to derive and validate the biotic ligand model for EPA.

I would think cleanup would be driven by accumulation into clam tissue (and effects on clams themselves or fish dietary analysis) and any water exceedences (transition zone water or surface water). I am not sure where this occurs as of yet, but I would say the analysis of the clam data will be very important as well as the water data.

I am attaching a paper from a colleague at NOAA who has been working on copper effects in fish if you are interested.

I hope this helps-

Jennifer

-----Original Message-----
From: Blischke.Eric@epamail.epa.gov
[mailto:Blischke.Eric@epamail.epa.gov]
Sent: Tuesday, December 05, 2006 10:57 AM
To: PETERSON Jenn L; POULSEN Mike
Subject: Bioaccumulative sediment criteria for Copper

I have a question about copper. Table 3-1 of the JSCS provides a bioaccumulative screening level for copper of 10 ppm. However, no value is provided for copper in the recent bioaccumulative guidance. Does copper bioacumulate? The PEC for copper is 149 ppm, the TEC is 31.9 ppm. Would we expect sediment cleanup levels to be based on some sort of bioaccumulative relationship or direct effects on the benthic community or something else?

Any thoughts on this would be appreciated.

Eric
(See attached file: copper synthesis setac 2006 poster.pdf)